FEASIBILITY ANALYSIS FOR A NJPDES-DSW PERMIT FINE ORGANICS CORPORATION FACILITY LODI, NJ

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CONTENTS

I. INTRODUCTION

This document provides additional information requested by PVSC, as a final report on the prior draft report entitled "Alternate Discharge of Ground Water Pretreatment System Preliminary Feasibility Study for Former Hexcel Corporation Site," prepared by Heritage Remediation Engineering, Inc., dated March 16, 1992. This final report presents the results of ENVIRON's evaluation of the feasibility of obtaining a New Jersey Pollutant Discharge Elimination System (NJPDES) Discharge to Surface Water permit (a "DSW permit") to discharge treated ground water to Saddle River from the Fine Organics Corporation facility in Lodi, NJ (the "Facility"), the remaining issue in PVSC's consideration of a permit application to discharge treated ground water to the industrial sewer. As discussed in greater detail below, the results of our evaluation indicate that the ground water treatment system that has been constructed at this Facility in accordance with NJDEPE and PVSC requirements will not achieve anticipated surface water discharge criteria under a DSW permit and normal operating conditions. We recommend, therefore, that the treated ground water should be discharged to the industrial sewer for final treatment at the PVSC treatment plant. Details of our analysis of the on-site ground water pretreatment system and the most sensible and appropriate means of discharge therefrom are presented below.

II. OVERVIEW OF DSW PERMITTING REQUIREMENTS

At issue in this analysis is whether or not the ground water pretreatment system constructed at the Facility can achieve a level of treatment that would allow discharge of the treated ground water to surface water (i.e., the Saddle River). The primary concern in this regard is the concentration of chemicals in the treated ground water and in Saddle River below the point of discharge.

Under state regulations, in order for the DSW permit to be feasible, the treated effluent must not cause exceedence of surface water quality criteria as listed in NJAC 7:9-4.14. These criteria vary, depending on the classification of the receiving stream. In this case, the Saddle River would be classified as FW2-NT/SE3. Because the Facility is located above any tidal influence, ENVIRON believes the FW2-NT classification would be the basis for setting discharge limitations.

NJAC 7:9-4.14 regulations require that "Toxic Substances" not exceed concentrations in surface water that would:

i "...affect human health or be detrimental to the natural aquatic biota...";

ii "...cause standards for drinking water to be exceeded...";

iii "...cause acute or chronic toxicity to aquatic biota...";

iv "...for nonpersistent toxic substances...not exceed one-twentieth (0.05) of acute definitive LC50 or EC50 value, as determined by appropriate bioassays..."; and

v "...for persistent toxic substances...not exceed one-hundredth (0.01) of the acute definitive LC50 or EC50 value, as determined by appropriate bioassays...".

Beyond these general criteria in the regulations, more specific requirements for setting concentration-based discharge limits for a DSW permit are described in <u>Requirements for Determination of Water Quality Based Effluent Limitations</u> (NJDEPE, February 19, 1991), a copy of which is provided in Appendix A (the "NJDEPE

Guidance). Under this NJDEPE Guidance a receiving waterbody analysis is required to set discharge limits, including a determination of the critical instream waste concentration and a water quality sampling and analysis program. Discharge limits are based on critical flow conditions in the stream (i.e., those that produce minimal dilution and thus have maximum impact on aquatic life). Under the NJDEPE Guidance, critical flow conditions correspond to periods of average 7-day, 10-year low flow. These conditions generally occur during low flow periods in late summer and early autumn.

In this analysis we have assumed that the effluent from the ground water pretreatment system would be discharged to the Saddle River. In order to protect the discharge from physical damage from debris and during flood conditions, however, treated effluent would first discharge into an enclosed tributary to the Saddle River which crosses the Facility property and outfalls into the Saddle River several hundred feet downstream of the Facility. This tributary drains a mixed commercial and residential area to the northeast of the Facility. No routine flow measurements have been made for the tributary from which low flow conditions can be estimated. Although this tributary is perennial (i.e., exhibits flow throughout the year), it is likely that during 7-day, 10-year low flow conditions, the flow in this tributary will be small, perhaps only a few gallons per minute. Any dilution of the treated effluent in the tributary, therefore, will be limited.

Based on our preliminary discussions with staff at the NJDEPE, and our analysis of the regulations regarding surface water discharges, ENVIRON believes that the surface water quality criteria referenced in NJAC 7:9-4.14 will be required to be met at the point that the tributary discharges to the Saddle River. Since the degree of dilution of the treated effluent in the tributary is unknown but expected to be small, it is reasonable, therefore, to expect that the concentration of chemicals in the effluent from the ground water pretreatment system must be consistently near the NJDEPE's concentration-based surface water quality criteria for a DSW permit to be feasible.

Chemical-specific effluent limitations can be established in part by conducting in-stream chemical analyses during the initial period of operation of the pretreatment system. The minimum requirements for these analyses include:

- weekly sampling for 8 weeks;
- water column and sediment sampling at the point of discharge, upstream, and downstream;
- analysis for all parameters for which a surface water quality criteria exists;
- dye studies to determine plume dispersion and mixing characteristics.

These in-stream analyses are primarily directed towards evaluation of the potential toxic impact of a discharge on aquatic organisms and the degree to which the receiving stream has been affected by other point or nonpoint sources. Previously, chemical tests of water in the Saddle River have been conducted as part of the initial studies at the Facility under the ECRA program (see Appendix B). These chemical tests indicate that the industrial chemicals detected in ground water at the Facility are not detected in Saddle River. This would imply, therefore, that the NJDEPE would almost certainly apply the most rigorous standards and criteria for the protection of water quality in the Saddle River.

In addition to the protection of aquatic organisms, an equally important aspect of the requirements in NJAC 7:9-4.14 are limitations on discharges so as not to exceed concentrations that would "...affect human health..." or "...cause standards for drinking water to be exceeded...". These requirements would apply to any chemical detected in ground water at the Facility that has a promulgated MCL or would pose an unacceptable cancer or noncancer risk if present in a drinking water supply. Given the FW2-NT classification of the Saddle River, therefore, it is expected that NJDEPE would apply any available MCL or health-based drinking water criteria in setting final effluent limitations for a DSW permit. As part of our analysis, ENVIRON obtained copies of current DSW permits for other industrial discharges to the Saddle River. A review of these permits indicates the routine use of drinking water standards by the NJDEPE in setting concentration-based limits on these discharges. Although most of the chemicals detected in ground water at the Facility do not have final promulgated MCLs, our review of the active DSW permits indicates that in the absence of an MCL the NJDEPE currently uses their health-based "Best Available Scientific Information" for evaluation of concentration-based discharge limits for compliance with NJAC 7:9-4.14 and issuance of DSW permits considering both aquatic toxicity and human health (cancer and noncancer) aspects. A copy of these criteria are attached with the NJDEPE Guidance.

The concentration-based limits in the NJDEPE Guidance for a surface water discharge for many of the chemicals detected in ground water at the Facility are typically in the very low to sub part-per-billion (ppb) range, based on human cancer risk (e.g., methylene chloride, 1,2-dichloroethane, 1,1,2,2-tetrachloroethane). The ground water pretreatment plant was designed to remove a wide range of these volatile and semi-volatile organic chemicals; however, the system was not designed to produce drinking water quality effluent.

The selection and sizing of the various unit processes in the ground water pretreatment system were based on normal pretreatment goals with discharge to a POTW. The level of treatment of ground water was designed to comply with the existing state and federal rules for such discharges, and further requirements established by the PVSC. These rules included EPA's categorical pretreatment standards for organic chemicals manufacturers (40 CFR Part 403 and Part 414), which allow individual VOC concentrations of up to several hundred ppb for discharges to publicly-owned treatment works (POTWs). Also considered was the draft permit issued for the Facility on Dec 17, 1991, in which the daily maximum level of total toxic organics (TTO) was limited to 2.13 mg/L. Under normal operating conditions the ground water pretreatment system should consistently achieve these requirements. ENVIRON believes, however, that these same processes will not treat ground water to a degree that would achieve drinking water or other health-based criteria and allow a surface water discharge.

III. GROUND WATER TREATMENT SYSTEM ANALYSIS

Overview

Discussions with PVSC personnel prior to the design and construction of the ground water pretreatment system indicated that the on-site industrial sewer would be used to discharge treated ground water to the PVSC plant. Accordingly, the ground water pretreatment system was designed and constructed to meet NJDEPE and PVSC requirements for a discharge to the PVSC sewer system. The ground water pretreatment system consists of flow equalization tanks, air stripping with off-gas incineration, and granular activated carbon (GAC) adsorption. Currently, the system is limited by an air permit to a water flow rate of 4.33 gpm, although the design flow rate is 15 gpm. Ground water, as well as water recovered from the DNAPL recovery system and the basement sump, will be treated by the system. The influent to the pretreatment system is expected to contain numerous chlorinated and nonchlorinated, volatile and semi-volatile chemicals at concentrations ranging up to several hundred parts per million (mg/L).

Air Stripping

Air stripping involves the transfer of chemical mass from the water phase to the air phase. The equilibrium concentration of a chemical in air is directly proportional to its concentration in water. This relationship is described by the Henry's law constant (K_H) for that particular chemical. A high K_H value indicates that equilibrium favors the gas phase, and the compound can be stripped from the aqueous phase by contact with a clean air stream. This is accomplished by countercurrent flow of air and water through a bed of packing material. Many VOCs have high K_H values and can be easily removed from water using this technique. Other factors important in air stripper design include air to water flow ratio, contact time, area available for mass transfer, temperature, and diffusion rates of the chemicals of concern through the air and water phases.

GAC Adsorption

GAC adsorption involves the removal of chemicals from the aqueous phase by adsorption onto a porous material having very high surface area. Because of its relatively high cost, the process is often used as a polishing step following another primary treatment technique (in this case air stripping). An adsorption coefficient (K_{oc}) can be used to describe equilibrium partitioning of the compound between the adsorbed and solution phases. Compounds with high K_{oc} values are most amenable to treatment with GAC. For mixed chemical streams, such as will be treated at the Facility, highly adsorbable compounds will be preferentially be removed from solution, and breakthrough will occur sooner for less adsorbable compounds than predicted by theoretical carbon use models. GAC units are commonly operated in a column mode where the GAC is replaced or regenerated when its adsorption capacity is exhausted.

Approach

As a first step in this analysis, ENVIRON compiled K_H and K_{oc} values for chemicals detected in ground water at the Facility. From this list, several compounds were selected based on their low K_H and low K_{oc} values, to evaluate whether the surface water criteria might be achieved in the effluent from the ground water pretreatment plant. A range of expected influent concentrations was determined based on the available data. A single value of influent concentration could not be determined, based on the uncertainty of information regarding the exact pumping rates and chemical concentrations within the various extraction areas at full operation of the treatment system. A more detailed evaluation of the treatment system was then conducted using actual pilot test data, supplemented by a theoretical air stripper model and existing treatment system design parameters.

Chemical Selection

Table 1 shows the K_H and K_{oc} data for chemicals detected in ground water at the Facility. Based on these data, five chemicals (as listed below) were chosen as being potentially difficult to treat to expected surface water criteria. The criteria shown for each of the chemicals listed are taken from the attached NJDEPE Guidance.

	Surface Water Criteria (ug/L)
• 1,2-Dichloroethane (DCA)	0.291
• Methylene Chloride ($MeCl_2$)	2.49
• 1,1,2,2-Tetrachloroethane (TetCA)	1.72
• Acetone	none
• Methyl Ethyl Ketone (MEK)	none

Both DCA and $MeCl_2$ are major constituents of ground water at the Facility, based on prior samples collected and analyzed by ENVIRON and Heritage. TetCA was detected in DNAPL samples and in ground water from well CW-5 and thus is likely to be present in the influent water. Acetone and MEK are the two compounds least amenable to treatment by air stripping and GAC adsorption. However, biological treatment such as provided at the PVSC plant is quite effective for both compounds. These latter compounds have not been routinely analyzed for on-site, but have been present in a majority of samples for which they were analyzed. Although acetone and MEK are priority pollutants, they do not have published surface water quality criteria.

Estimation of Influent Concentration Ranges

For each of the five chemicals listed above, likely influent concentration ranges were determined based on the available ground water data from selected wells. The available data are summarized in Table 2. These wells were selected to provide an approximation of a flow average concentration from the extraction well and the DNAPL recovery systems. Based on the available information, the following influent concentration ranges were estimated:

- DCA 2 - 20 mg/L
- $MeCl_2$ 50 - 500 mg/L
- TetCA 0.50 - 5 mg/L

- Acetone 0.05 - 0.5 mg/L
- MEK 0.02 - 0.2 mg/L

Air Stripper Performance

The removal efficiency of DCA and $MeCl_2$ can be estimated from preliminary performance testing of the air stripping system by Heritage. The test data are shown in Appendix C and indicate a removal of 99.7 and 99.5% of these two chemicals, respectively. It should be noted that the observed removal efficiencies are somewhat lower than would have been predicted by theoretical models. Using a reasonable estimate of influent concentration of DCA and $MECl_2$ of 6 and 130 ppm, respectively, and the above-cited observed removal efficiencies from the performance tests, reasonable estimates of the concentrations of these two chemicals in the air stripper effluent are 18 ppb and 650 ppb, respectively. Further treatment would be provided by the GAC units.

An air stripper model (based on Roberts et al., 1985) was also applied to simulate performance of the existing air stripper system for removal of TetCA, acetone, and MEK, since these chemicals were not analyzed in the initial performance tests. The existing system was modeled as a 2 ft diameter, 30 ft high stripping tower (equivalent to the two 15 ft towers in series) packed with 2.3 inch LANPAC and operating at the design flowrate of 15 gpm. The design air:water flow ratio of 224:1 is quite high, based on ENVIRON's past experience with air stripper design. High air:water ratios substantially increase the air pressure drop through the packing, and can result in entrainment of the water by the rising air (Kavanaugh and Trussell, 1980). To allow for adjustment of the treatment system at full operation, therefore, air:water flow ratios of both 224:1 and 100:1 were modeled together with the anticipated ranges of concentrations shown above.

The modeling results for the air stripper are summarized in Table 3. As shown, air stripper effluent is not anticipated to meet surface water quality criteria for TetCA. In addition, acetone and MEK concentrations are essentially unaffected by air stripping (with removal percentages ranging from only 9 to 24%). The results demonstrate the need for GAC adsorption as an effluent polishing step.

The apparent reduced efficiency of removal of volatile chemicals by air stripping may result from two aspects of the chemistry of on-site ground water. First, the ground water recovered from the Facility will contain many volatile chemicals, some of which will be at concentrations approaching solubility limits. The presence of high concentrations of numerous volatile chemicals in the air within the environment of the air stripper may influence and reduce the efficiency of removal of specific chemicals in comparison to theoretical models. In addition, the Facility has for many years manufactured various alkaline and nonalkaline cleaning products. Although specific chemical tests have not been performed to test the presence of these products in ground water, it is reasonable to expect their presence, based on ENVIRON's observation that the most likely mechanism for release of chemicals into soil and ground water at the Facility is the same for the raw and finished products (i.e., incidental spills from manufacturing areas and leakage from underground plumbing systems). The influence of detergent-like chemicals on the ground water pretreatment system should be to reduce the efficiency of removal in the air stripper system. This reduced efficiency affects removal of many of the volatile chemicals in ground water, including methylene chloride, as is evident by the average removal of 99.2% to 99.8% of the volatiles in the initial performance tests (see Appendix C). As a result, it is expected that the theoretical removal of the volatile chemicals reflected in Table 3 is an upperbound estimate, and the actual removal of chemicals in the air stripping system may be somewhat lower at full-scale operations.

Evaluation of GAC Usage and Effectiveness

To further reduce effluent concentrations, the existing ground water pretreatment system includes two 1000-lb GAC units connected in series to treat air stripper effluent. These units are expected to be effective in removing many of the semi-volatile chemicals not amenable to air stripping (for example, phthalates and dichlorobenzenes). However, even low concentrations of compounds having very low K_{oc} values, such as $MeCl_2$, acetone, and MEK, will be difficult to treat. For example, a recent journal article (Adams and Clark, 1991) estimated that carbon usage to reduce $MeCl_2$ from 100 to 5 ppb would be thirty times the amount to reduce trichloroethylene by the same levels. As a result, inefficient carbon use and rapid breakthrough of these chemicals from the GAC units is expected.

Air stripping is expected to be ineffective for removal of semi-volatile chemicals detected in ground water at the Facility, and these chemicals will enter the GAC units at relatively high concentrations. These readily adsorbed chemicals, along with any other compounds not removed by the air stripper, will compete with $MeCl_2$, acetone, MEK, and other VOCs for GAC adsorption sites. Under these conditions, quantitative estimates of breakthrough times and effluent concentrations are difficult to make, but it is likely that treatment of VOCs with relatively low K_{oc} values to low ppb levels will be very difficult to routinely achieve under normal operations.

IV. SUMMARY AND CONCLUSIONS

ENVIRON analyses indicate that final effluent concentrations of many of the VOCs treated in the existing ground water pretreatment system will likely be in the range of a few to several hundred ppb during full-scale operation of the system. These concentrations can be easily assimilated by a conventional waste water collection and treatment system, such as is provided by PVSC, and are consistent with the prior effluent limitations established by the PVSC for the Facility. In addition, these concentration ranges are not believed to present any unusual operation problems or safety concerns in the industrial sewer at the POTW. The expected effluent concentrations, however, will almost certainly exceed current surface water discharge criteria for a number of chemicals under normal operations. The discharge of treated ground water to the Saddle River is, therefore, not a feasible option under current regulations of the NJDEPE. Discharge of the effluent to the PVSC sewer system is recommended.

REFERENCES

Adams, J. Q. and R. M. Clark. 1991. Evaluating the costs of packed-tower aeration and GAC for controlling selected organics. Jour. AWWA 49-57.

Ashworth, R. A., Howe, G. B., Mullins, M. E., and T. N. Rogers. 1988. Air-water partitioning coefficients of organics in dilute aqueous solutions. Jour. Haz. Mat. 18:25-36.

Kavanaugh, M. C. and R. R. Trussell. 1980. Design of aeration towers to strip volatile contaminants from drinking water. Jour. AWWA 684-692.

Roberts, P. V., Hopkins, G. D., Munz, C., and A. H. Riojas. 1985. Evaluating two-resistance models for air stripping of volatile organic contaminants in a countercurrent, packed column. Environ. Sci. Technol. 19:164-173.

USEPA. 1990. Basics of pump-and-treat ground-water remediation technology. EPA/600/8-90/003.

Table 1: Screening of Compounds for Treatment by Air Stripping and GAC Adsorption
Hexcel Site

Compound	Conc. Rating (1)	Henry's K (atm m3/mol	Ref	Equil. Cair/Cw	Koc (mL/g)	Ref
Benzene	2	3.90E-03	Ash	0.165	83	EPA
Chlorobenzene	1	2.80E-03	Ash	0.118	330	EPA
Chloroethane	1	9.60E-03	Ash	0.406	17	EPA
Chloroform	2	2.30E-03	Ash	0.097	47	EPA
1,1-Dichloroethane	3	4.50E-03	Ash	0.190	300	EPA
1,2-Dichloroethane *	1	1.30E-03	Ash	0.055	140	EPA
trans-1,2-Dichloroethylene	1	7.10E-03	Ash	0.300	59	EPA
Ethylbenzene	3	4.50E-03	Ash	0.190	1100	EPA
Methylene Chloride *	1	1.70E-03	Ash	0.072	8.8	EPA
Tetrachloroethylene	1	1.10E-02	Ash	0.465	364	EPA
1,1,1-Trichloroethane	2	1.20E-02	Ash	0.508	152	EPA
1,1,2-Trichloroethane	3	6.30E-04	Ash	0.027	56	EPA
Trichloroethylene	1	6.70E-03	Ash	0.284	126	EPA
Toluene	1	4.90E-03	Ash	0.207	300	EPA
Vinyl Chloride	3	1.70E-02	Ash	0.719	57	EPA
1,1,2,2-Tetrachloroethane *	3	2.00E-04	Ash	0.008	118	EPA
Carbon Tetrachloride	3	1.90E-02	Ash	0.804	439	EPA
1,1-Dichloroethene	4	2.03E-02	Ash	0.859	65	EPA
2,4-Dimethylphenol	3	6.70E-03	Ash	0.284	222	EPA
2-Chlorophenol	3	1.10E-05	EPA	0.000	400	EPA
Phenol	3	4.50E-07	EPA	0.000	14.2	EPA
1,2-Dichlorobenzene	3	1.40E-03	Ash	0.059	1700	EPA
1,3-Dichlorobenzene	3	2.30E-03	Ash	0.097	1700	EPA
1,4-Dichlorobenzene	3	2.20E-03	Ash	0.093	1700	EPA
Bis(2-ethylhexyl) phthalate	3	3.60E-07	EPA	0.000	5900	EPA
Diethyl phthalate	3	1.10E-06	EPA	0.000	142	EPA
Dimethyl phthalate	3	no data			no data	
Naphthalene	3	1.20E-03	EPA	0.051	1300	EPA
Xylenes	3	5.00E-03	Ash	0.212	900	EPA
Acetone *	2	2.06E-05	EPA	0.001	2.2	EPA
MEK *	2	2.74E-05	EPA	0.001	4.5	EPA

Notes:

(1) 1=highest
Ash = Ashworth et al., 1988 (T = 15 C).
EPA = USEPA, 1990.

Table 2: Influent Characteristics for Ground Water Treatment System (mg/L)
Hexcel Site

	CW-3	CW-5 (1)	CW-11	MW-6 DNAPL	MW-6 Water
DCA	ND	ND	ND	38000	110
MeCl2	14.2	836	2,315	16000	74
TetCA	ND	2.88	ND	760	ND
Acetone	0.171	-	0.65	-	-
MEK	ND	-	0.182	-	-

Notes:

(1) Average of two samples

- denotes not analyzed

ND denotes not detected

DNAPL recovery and basement sump water will also be routed to the treatment plant. These are inflows containing very high chemical concentrations.

Acetone and MEK were detected in a majority of ENVIRON's ECRA samples that were analyzed for TICs. Acetone was present in ground water samples at up to 30 ppb. In soil samples, acetone ranged as high as 1100 ppm, and MEK as high as 29 ppm.

Table 3: Air Stripper Model Results
Hexcel Site

1,1,2,2-Tetrachloroethane - SW Criteria = 1.72 ppb

Q liq (gpm)	Q air (cfm)	Gas/Liq	Cinfl (ppb)	C effl (ppb)	% Removal
15	450	224/1	500	50.5	89.9
15	200	100/1	500	178.5	64.3
15	450	224/1	5000	505	89.9
15	200	100/1	5000	1785	64.3

MEK - no SW Criteria

Q liq (gpm)	Q air (cfm)	Gas/Liq	Cinfl (ppb)	C effl (ppb)	% Removal
15	450	224/1	20	15.2	24.0
15	200	100/1	20	17.7	11.5
15	450	224/1	200	152	24.0
15	200	100/1	200	177	11.5

Acetone - no SW Criteria

Q liq (gpm)	Q air (cfm)	Gas/Liq	Cinfl (ppb)	C effl (ppb)	% Removal
15	450	224/1	50	40.7	18.6
15	200	100/1	50	45.6	8.8
15	450	224/1	500	407	18.6
15	200	100/1	500	456	8.8

Notes:

Flow rates of 15 gpm and 450 cfm were taken from Heritage's blueprints. Currently, the discharge limit is 4.33 gpm, according to the air permit.

APPENDIX A

REQUIREMENTS FOR DETERMINATION OF WATER QUALITY BASED EFFLUENT LIMITATIONS

The following information shall be submitted by the applicant for a water quality based effluent limitation, in addition to any information required pursuant to N.J.A.C. 7:14A:

1. Type of waste (domestic or industrial) to be discharged, accompanied by an analysis of the treat 1 and untreated wastewater characteristics (analysis to include chemical specific and whole effluent toxicity testing).

2. Type of treatment process and level of treatment either existing or being considered.

3. Original U.S. Geological Survey Topographic Maps, 7.5 Quadrangle series, showing treatment facility locations, discharge point, and the location of other treatment facilities on the receiving waterbody within five miles of the existing or proposed discharge.

4. Name and classification of receiving waterbody including a description of the waterbody's existing beneficial uses.

5. Receiving waterbody analysis, which shall include:

   (a) A determination of the Critical Instream Waste Concentration (IWC - see definition below), with documentation.

   (b) A water quality analysis program to be developed in coordination with the Department and to include, at a minimum, sampling stations upstream and downstream of all existing discharges, as well as any proposed discharge.

For guidance see the U.S. Environmental Protection Agency documents given in the attached list.

Determination of Critical Instream Waste Concentration

For discharges into non-tidal streams, or small tidal streams with a cross-sectional area not greater than 1,000 square feet at mean sea level and inflow MA7CD10 (minimum average 7 consecutive day flow with a statistical recurrence interval of 10 years) not greater than 10 cubic feet per second:

$$I = \frac{Q_e}{Q_e + Q_s}$$

where I = Critical Instream Waste Concentration

Q_e = Effluent Flow

Q_s = Upstream Freshwater MA7CD10 Flow

For all other waterbodies the instream waste concentration, I, will be determined on a case-by-case basis utilizing applicable scientific methods, including, but not limited to, plume models and the mixing zone concept.

MIXING ZONE IMPLEMENTATION POLICIES FOR THE DISCHARGE OF TOXIC SUBSTANCES INTO TIDALLY INFLUENCED WATERS

Regulatory Authority

N.J.A.C. 7:14A-3.14 sets the procedures for calculating New Jersey Pollutant Discharge Elimination System (NJPDES) Discharge to Surface Water (DSW) permit conditions. Paragraph (k) states that:

"Water quality based effluent limitations applicable to discharge into surface waters of the state shall be developed in accordance with 'Wastewater Discharge Requirements', N.J.A.C. 7:9-5 and/or 'Surface Water Quality Standards", N.J.A.C. 7:9-4.

Paragraph (b) of N.J.A.C. 7:9-4.6 relates how water quality based effluent limitations are to be included in draft and final NJPDES permits and Discharge Allocation Certificates (DACs). Specifically, this paragraph states, ". . . the water quality based effluent limitations incorporated into the Final NJPDES Permit or DAC must be consistent with the provisions of N.J.A.C. 7:9-4 (including, but not limited to 7:9-4.5, 4.6(c), and 4.9). Paragraph (c)4 of N.J.A.C. 7:9-4.5 contains the mixing zone policies. Although mixing zone requirements are determined on a case-by-case basis, the purpose of this implementation policy is to assure consistency among dischargers while providing for attainment and maintenance of water quality criteria and standards.

This implementation policy will also be used in the development of water quality based whole effluent toxicity limitations, where appropriate, to determine the instream waste concentration in accordance with N.J.A.C. 7:9-4.6(c)5ii(2).

Implementation Policy

The mixing zone implementation policy is based on and is consistent with the following U.S. Environmental Protection Agency (EPA) publications:

Technical Support Document for Water Quality-based Toxics Control, September 1985, EPA-440/4-85-032

Permit Writer's Guide to Water Quality-Based Permitting for Toxic Pollutants, July 1987, EPA-440/4-87-005

Water Quality Standards Handbook, December 1983

The following mixing zone implementation policies are to be applied during critical conditions. Critical conditions are those that produce minimal dilution and/or have maximum environmental impact on aquatic life and the designated uses of the receiving waterbody.

For submerged outfalls using a high-rate diffuser (exit velocity greater than 10 feet per second) chronic criteria will be applied at the edge of the mixing zone. The edge of the mixing zone being defined as the point where the effluent plume is indistinguishable from background conditions measured with a conservative dye. Acute criteria will be applied at the edge of the zone of initial dilution (ZID). The ZID is the region of initial mixing surrounding or adjacent to the end of the outfall diffuser. Initial dilution is the flux-averaged dilution (averaged over the cross-sectional area of the plume) achieved during the period when dilution is primarily a result of plume entrainment (i.e. mixing is due to the initial momentum and buoyancy of the plume).

For submerged outfalls that do not have a high-rate diffuser chronic criteria will be applied at the ZID and acute criteria will be applied at the end-of-pipe.

Use of the ZID and edge of mixing zone as physical mixing zone dimensions must conform to the following mixing zone policies as stated in N.J.A.C. 7:9-4.5(c)4:

iii. The total area and volume of a waterway or waterbody assigned to mixing zones shall be limited to that which will not interfere with biological communities or populations of important species to a degree which is damaging to the ecosystem or which diminishes other beneficial uses disproportionately. Furthermore, significant acute mortality of aquatic biota shall not occur within the mixing zone.

iv. Zones of passage shall be provided for the passage of free-swimming and drifting organisms wherever mixing zones are allowed.

Physical mixing zones that occupy less than 1/4 the cross-sectional area of a waterbody up to a maximum of 100 meters in any direction from the discharge outlet structure are assumed to be in compliance with the above narrative.

For discharges that are not submerged, both chronic and acute criteria will be applied at the end-of-pipe unless site specific conditions warrant otherwise.

All water quality analysis programs and dilution studies must be performed in accordance with an approved Work/Quality Assurance Plan. The plan must conform to the guidance contained in:

> Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring. (OWRS QA-1), Office of Water Regulations and Standards, USEPA.

Critical Conditions

Critical conditions are those that produce minimal dilution and/or cause the maximum environmental impact on aquatic life and the designated uses of the receiving waterbody. One of the primary concerns in defining critical conditions is stratification of the receiving waterbody. For the purposes of this document stratification refers to salinity and/or thermal variations which occur over a vertical profile in the receiving waterbody.

For non-tidal streams and rivers, critical conditions are periods of low fresh water flows. These conditions generally occur between August 15 and October 15.

In large lakes or stagnant lakes and ponds, critical conditions occur if the water stratifies. Stratification of these waterbodies is most likely during the summer months.

For tidal, non-stratified waterbodies minimal dilution occurs when fresh water inflows are at a minimum and a low water slack period during a spring tide occurs. These conditions should occur between August 15 and October 15. Also, to determine the maximum areal extent of the plume, maximum velocity during a tidal cycle should be examined.

For tidal, stratified waterbodies minimal dilution may occur at either minimal fresh water flows or at times of maximum stratification. In addition to the above non-stratified conditions the following should also be examined. For estuaries and tidal portions of streams that are likely to be salinity stratified maximum stratification would occur during periods of high fresh water inflows at low water slack during a neap tide. This should occur between March 1 and April 15. For coastal waters that are likely to be thermally stratified maximum stratification should occur between May 1 and August 1.

Water Quality Analysis Program

Additional specific guidance for conducting water quality analysis programs is found in the following publications:

Field Procedures Manual For Water Data Acquisition, NJDEP-Division of Water Resources. This manual is available through the Bureau of Monitoring Management, P.O. Box CN029, Trenton, NJ 08625

USEPA Handbook - Stream Sampling for Waste Load Allocation Applications

The guidance given here represents minimum requirements for water quality sampling. Additional requirements may be necessary on a case by case basis.

Frequency of sampling shall be weekly for 8 weeks. At least 2 sample sets must be taken during critical conditions. Water column samples shall be analyzed for each parameter for which a surface water quality criteria for aquatic life and/or human health protection exists (see Appendix A). Sampling frequency may be reduced or eliminated if a parameter is proven absent from the wastewater (non-detectable in 4 representative samples). At least one sediment sample shall be taken and analyzed for the same parameters as the water column.

For non-tidal waterbodies, at a minimum, samples shall be taken at the point of discharge (existing or proposed) and at least one location upstream and one location downstream. For tidal waterbodies, at a minimum, samples shall be taken at the point of discharge (existing or proposed) at high, low, and slack tide (either high or low slack). Attempt to sample at or near the highest current velocity during the high and low tidal phases. Depending on site specific conditions, additional samples may be required to define loads from other point sources, tributaries, non-point sources, etc.

For an existing discharge the effluent shall be sampled and analyzed concurrently with each water column sampling.

Dye Studies

To conduct effluent dilution studies for mixing zone considerations and determination of critical Instream Waste Concentrations (IWC) requires the release and sampling of a conservative tracer dye during critical conditions and use of a computer model to simulate the movement of the effluent plume under various conditions.

The release and sampling of a conservative tracer dye is used to determine the mixing characteristics and movement of an effluent plume in a receiving waterbody. The results of a dye study are also used to calibrate and verify computer simulation models that can be used to describe the behavior of the effluent plume for conditions not sampled using dye. In order to conduct the study a conservative dye must be continuously introduced into the effluent maintaining a constant concentration in the effluent. The effluent discharge rate should be kept at as constant a rate as possible at a level that reflects the average discharge rate. Dye concentrations in the receiving waterbody should be sampled and analyzed in sufficient number, horizontal and vertical extent, and time duration to delineate the ZID and the edge of the mixing zone. The recommended dye is Rhodamine WT. Use of another dye requires that the following information be submitted 21 days prior to the planned release of dye:

1. Name of dye.
2. Physical characteristics of the dye.
3. Available toxicity information on the dye.
4. Concentration at which dye is visible.
5. Planned concentration and total mass of dye to be discharged in the effluent.

Before any dye is released the appropriate Bureau of Regional Enforcement shall be notified at least 48 hours prior to release of dye.

Metro Bureau - (201) 669-3900
Bergen, Essex, Hudson, Union Counties

Central Bureau - (609) 426-0786
Burlington, Mercer, Middlesex, Monmouth, Ocean Counties

Northern Bureau - (201) 299-7592
Hunterdon, Morris, Passaic, Somerset, Sussex, Warren Counties

Southern Bureau - (609) 346-8032
Atlantic, Camden, Cape May, Cumberland, Gloucester, Salem Counties

Computer Models

There exist several models developed for USEPA that simulate effluent plumes from submerged or surface discharges. The following are the minimum data requirements to use the models:

Ambient current speed and direction Outfall characteristics
Number of ports
Port effective diameter
Port spacing
Port orientation
Discharge depth
Effluent flowrate
Density (or salinity and temperature) of effluent
Density (or salinity and temperature) gradient in receiving waterbody

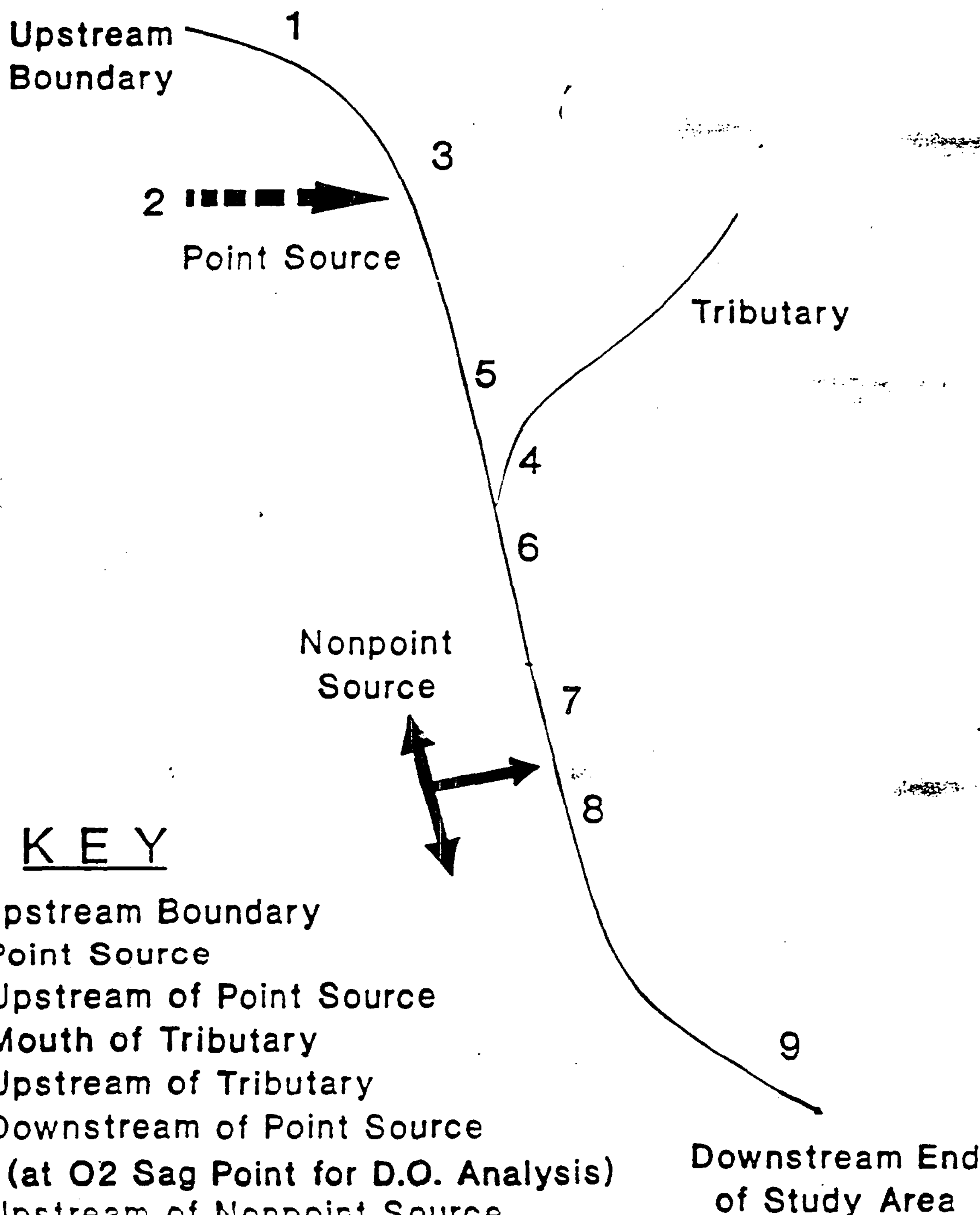
For submerged outfalls the following USEPA models are available:

PLUME, OUTPLM, DKHDEN, MERGE, LINE, CORMIX1

For surface discharges the following USEPA models are available:

PDS, PDSM, MOBEN, PSY

Recommended Locations for Sampling Program



KEY

1. Upstream Boundary
2. Point Source
3. Upstream of Point Source
4. Mouth of Tributary
5. Upstream of Tributary
6. Downstream of Point Source (at O2 Sag Point for D.O. Analysis)
7. Upstream of Nonpoint Source
8. Downstream of Nonpoint Source
9. Downstream of Study Area

State of New Jersey
Department of Environmental Protection and Energy
Environmental Regulation
Wastewater Facilities Regulation Element
CN 029
Trenton, NJ 08625-0029

Scott A. Weiner
Commissioner

Dennis Hart
Administrator

MEMORANDUM

TO: Dennis Hart, Administrator

SHH

FROM: Dr. Shing-Fu Hsueh, Chief
Bureau of Water Quality Standards & Analysis

DATE: February 18, 1992

SUBJECT: Criteria Based on Best Available Scientific Information

The attached table presents criteria based on the best available scientific information to be used in establishing water quality based effluent limitations, pursuant to N.J.A.C. 7:9-4.6(c)4iii, in the absence of formally promulgated NJDEPE criteria. This table and the criteria in the table replace and supersede all previous lists of criteria based on the best available scientific information. Also included on the attached table are the best available scientific information-based criteria for toxic substances for which the Department has formally promulgated criteria. Where there are adopted criteria, the best available scientific information-based criteria are identified by crossing them out ~~thus~~. The formally promulgated NJDEPE criteria must be used instead of crossed out criteria based on best available scientific information. (In some instances these criteria are the same) A brief discussion of the differences between the attached table and the table dated February 6, 1992 is provided below.

The notation for the saline water, aquatic protection ammonia criteria has been changed to indicate that the criterion "0.1 of acute definitive LC50 or EC50" represents a chronic criterion. This is based on our reading of the criterion to indicate that the 0.1 factor applies to an acute definitive LC50 or an acute definitive EC50. In each instance the intent was to use acute data to provide chronic protection.

Best Available Scientific Information - Based Surface Water Quality Criteria
February 18, 1992

Substance		Criteria	Classifications
4. Aldrin	(1)	~~3.0(a)~~; 0.000135(hc)	All FW2
	(2)	~~1.3(a)~~; 0.000144(hc)	All SE, SC
5. Aluminum (Total recoverable)	(1)	750(a); 87(c)	All FW2
6. Ammonia, un-ionized (24-hour average)	(1)	~~20(c)~~	FW2-TP, FW2-TM
	(2)	~~50(c)~~	FW2-NT
	(3)	~~0.1-of-acute-definitive-LC50-or-EC50-(c)~~	All SE, SC
7. Anthracene	(1)	9,570(h)	All FW2
	(2)	108,000(h)	All SE, SC
8. Antimony	(1)	12.2(h)	All FW2
	(2)	4,300(h)	
9. Arsenic (Total recoverable)	(1)	360(a); 190(c); ~~0.0170(hc)~~	All FW2
	(2)	69(a); 36(c); 0.136(hc)	All SE, SC
10. Asbestos	(1)	7 million fibers/L (h) (fibers longer than 10 micrometers)	All FW2
11. Barium	(1)	~~2,000(h)~~	All FW2
12. Benz(a)anthracene	(1)	0.0028(hc)	All FW2
	(2)	0.031(hc)	All SE, SC
13. Benzene	(1)	0.150(hc)	All FW2
	(2)	71(hc)	All SE, SC

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Best Available Scientific Information - Based Surface Water Quality Criteria
February 18, 1992

Substance		Criteria	Classifications
24. Bis(2-chloroisopropyl) ether	(1)	1,250(h)	All FW2
	(2)	170,000(h)	All SE, SC
25. Bis(2-ethylhexyl) phthalate	(1)	1.76(hc)	All FW2
	(2)	5.92(hc)	All SE, SC
26. Bromodichloromethane (Dichlorobromomethane)	(1)	0.266(hc)	All FW2
	(2)	22(hc)	All SE, SC
27. Bromoform	(1)	4.38(hc)	All FW2
	(2)	360(hc)	All SE, SC
28. Butylbenzyl phthalate	(1)	239(h)	All FW2
	(2)	416(h)	All SE, SC
29. Cadmium (Total recoverable)	(1)	$e^{(1.128(\ln(H))-3.828)}$ (a); $e^{(0.7852(\ln(H))-3.490)}$ (c); ~~15.9(h)~~	All FW2
	(2)	43(a); 9.3(c); ~~169(h)~~	All SE, SC
30. Carbon tetrachloride	(1)	0.363(hc)	All FW2
	(2)	6.31(hc)	All SE, SC
31. Chlordane	(1)	~~2.4(a)~~; ~~0.0043(c)~~; 0.000277(hc)	All FW2
	(2)	~~0.09(a)~~; ~~0.0040(c)~~; 0.000283(hc)	All SE, SC
32. Chloride	(1)	250,000 (ol); 860,000(a); 230,000(c)	All FW2
33. Chlorine Produced Oxidants (CPO)	(1)	~~19(a)~~; ~~11(c)~~	All FW2
	(2)	~~13(a)~~; ~~7.5(c)~~	All SE, SC

Best Available Scientific Information - Based Surface Water Quality Criteria
February 18, 1992

Substance		Criteria	Classifications
34. Chlorobenzene	(1)	22.0(h)	All FW2
	(2)	21,000(h)	All SE, SC
35. Chloroform	(1)	5.67(hc)	All FW2
	(2)	470(hc)	All SE, SC
36. 2-Chlorophenol	(1)	122(h)	All FW2
	(2)	402(h)	All SE, SC
37. Chlorpyrifos	(1)	0.083(a); 0.041(c)	All FW2
	(2)	0.011(a); 0.0056(c)	All SE, SC
38. Chromium (Total recoverable)	(1)	16(a); 11(c); ~~160(h)~~	All FW2
	(2)	1,100(a); 50(c); 3,230(h)	All SE, SC
39. Chrysene	(1)	0.0028(hc)	All FW2
	(2)	0.031(hc)	All SE, SC
40. Copper (Total recoverable)	(1)	$e^{(0.9422(\ln(H))-1.464)}$ (a); $e^{(0.8545(\ln(H))-1.465)}$ (c)	All FW2
	(2)	2.9(a); 2.9(c)	All SE, SC
41. Cyanide	(1)	22(a); 5.2(c); 768(h)	All FW2
	(2)	1.0(a); 1.0(c); 220,000(h)	All SE, SC
42. 4,4'-DDD (p,p'TDE)	(1)	0.000832(hc)	All FW2
	(2)	0.000837(hc)	All SE, SC
43. 4,4'-DDE	(1)	0.000588(hc)	All FW2
	(2)	0.000591(hc)	All SE, SC

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Best Available Scientific Information - Based Surface Water Quality Criteria
February 18, 1992

Substance		Criteria	Classifications
65. Endosulfans (alpha and beta)	(1)	~~0.22(a)~~; ~~0.056(c)~~; 0.932(h)	All FW2
	(2)	~~0.034(a)~~; ~~0.0087(c)~~; 1.99(h)	All SE, SC
66. Endosulfan sulfate	(1)	0.93(h)	All FW2
	(2)	2.0(h)	All SE, SC
67. Endrin	(1)	~~0.18(a)~~; ~~0.0023(c)~~; 0.629(h)	All FW2
	(2)	~~0.037(a)~~; ~~0.0023(c)~~; 0.678(h)	All SE, SC
68. Endrin aldehyde	(1)	0.76(h)	All FW2
	(2)	0.81(h)	All SE, SC
69. Ethylbenzene	(1)	3,030(h)	All FW2
	(2)	27,900(h)	All SE, SC
70. Fluoranthene	(1)	310(h)	All FW2
	(2)	393(h)	All SE, SC
71. Fluorene	(1)	1,340(h)	All FW2
	(2)	15,100(h)	All SE, SC
72. Guthion	(1)	0.01(c)	All FW2, SE and SC
73. Heptachlor	(1)	~~0.52(a)~~; ~~0.0038(c)~~; 0.000208(hc)	All FW2
	(2)	~~0.053(a)~~; ~~0.0036(c)~~; 0.000214(hc)	All SE, SC
74. Heptachlor epoxide	(1)	0.52(a); 0.0038(c); 0.000103(hc)	All FW2
	(2)	0.053(a); 0.0036(c); 0.000106(hc)	All SE, SC
75. Hexachlorobenzene	(1)	0.000748(hc)	All FW2
	(2)	0.000775(hc)	All SE, SC

Best Available Scientific Information - Based Surface Water Quality Criteria
February 18, 1992

Substance		Criteria	Classifications
86. Methoxychlor	(1)	0.03(c); 40(h)	All FW2
	(2)	0.03(c)	All SE, SC
87. Methyl bromide (Bromomethane)	(1)	48.4(h)	All FW2
	(2)	4,000(h)	All SE, SC
88. Methyl chloride (Chloromethane)	(1)	5.7(hc)	All FW2
	(2)	470(hc)	All SE, SC
89. Methylene chloride	(1)	2.49(hc)	All FW2
	(2)	1,600(hc)	All SE, SC
90. Mirex	(1)	0.001(c)	All FW2, SE and SC
91. Nickel (Total recoverable)	(1)	$e^{(0.8460(\ln(H))+3.3612)}$ (a); $e^{(0.8460(\ln(H))+1.1645)}$ (c); 516(h)	All FW2
	(2)	75(a); 8.3(c); 3,900(h)	All SE, SC
92. Nitrate (as N)	(1)	10,000(h)	All FW2
93. Nitrobenzene	(1)	16.0(h)	All FW2
	(2)	1,900(h)	All SE, SC
94. N-Nitrosodi-n-butylamine	(1)	0.00641(hc)	All FW2
95. N-Nitrosodiethylamine	(1)	0.000233(hc)	All FW2

Substance		Criteria	Classifications
105. Polychlorinated biphenyls (PCBs-1242, 1254, 1221, 1232, 1248, 1260, and 1016)	(1)	~~0.014(c)~~; 0.000244(hc)	All FW2
	(2)	~~0.030(c)~~; 0.000247(hc)	All SE, SC
106. Pyrene	(1)	797(h)	All FW2
	(2)	8,970(h)	All SE, SC
107. Selenium (Total recoverable)	(1)	20(a); 5.0(c); ~~179(h)~~	All FW2
	(2)	300(a); 71(c); 6,800(h)	All SE, SC
108. Silver (Total recoverable)	(1)	$e^{(1.72(\ln(H))-6.52)}$ (a); ~~164(h)~~	All FW2
	(2)	2.3(a); 65,000(h)	All SE, SC
109. Sulfide-hydrogen sulfide (undissociated)	(1)	2(c)	All FW2, SE and SC
110. 1,2,4,5-Tetra-chlorobenzene	(1)	2.56(h)	All FW2
	(2)	3.25(h)	All SE, SC
111. 2,3,7,8-Tetrachloro-dibenzo-p-dioxin (TCDD)	(1)	0.000000013(hc)	All FW2
	(2)	0.000000014(hc)	All SE, SC
112. 1,1,2,2-Tetrachloro-ethane	(1)	1.72(hcc)	All FW2
	(2)	11(hc)	All SE, SC

Best Available Scientific Information - Based Surface Water Quality Criteria
February 18, 1992

Substance		Criteria		Classifications
124. Zinc (Total recoverable)	(1)	$e^{(0.8473(\ln(H))+0.8604)}$	(a);	All FW2
		$e^{(0.8473(\ln(H))+0.7614)}$	(c);	
	(2)	95(a); 86(c)		All SE, SC

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APPENDIX B - FRESHWATER AQUATIC CRITERIA FOR HARDNESS DEPENDENT METALS IN UG/L

RECEIVING WATER HARDNESS, mg/l as CaCO3

	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
CADMIUM																
Acute	1.8	2.2	2.6	3.0	3.5	3.9	4.4	4.8	5.3	5.7	6.2	6.7	7.1	7.6	8.1	8.6
Chronic	0.66	0.76	0.86	0.95	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.6	1.7	1.8	1.9	2.0
COPPER																
Acute	9.2	11	13	14	16	18	19	21	23	24	26	28	29	31	32	34
Chronic	6.5	7.6	8.7	9.8	11	12	13	14	15	16	17	18	19	20	20	21
LEAD																
Acute	34	43	52	61	71	82	92	100	110	130	140	150	160	170	180	200
Chronic	1.3	1.7	2.0	2.4	2.8	3.2	3.6	4.0	4.4	4.9	5.3	5.8	6.3	6.7	7.2	7.7
NICKEL																
Acute	790	920	1000	1200	1300	1400	1500	1700	1800	1900	2000	2100	2200	2300	2400	2500
Chronic	88	100	120	130	140	160	170	180	200	210	220	230	250	260	270	280
SILVER																
Acute	1.2	1.7	2.2	2.8	3.4	4.1	4.8	5.6	6.4	7.2	8.2	9.1	10	11	12	13
ZINC																
Acute	65	76	87	97	100	120	130	140	150	160	160	170	180	190	200	210
Chronic	59	69	78	88	97	110	110	120	130	140	150	160	170	170	180	190

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7:9-4.14 (c) Surface Water Quality Criteria for FW2, SE and SC Waters

(Expressed as maximum concentrations unless otherwise noted)

Substance		Criteria	Classifications
1. Bacterial quality (Counts/100 ml)	i.	Bacterial Indicators shall not exceed, in all shellfish waters, the standard for approved shellfish waters as established by the National Shellfish Sanitation Program as set forth in its current manual of operations.	Shellfish Waters
	ii.	Fecal Coliforms:	
	(1)	Fecal coliform levels shall not exceed a geometric average of 50/100 ml.	Within 1500 feet of shoreline in SC waters.
	(2)	Fecal coliform levels shall not exceed a geometric average of 200/100 ml nor should more than 10 percent of the total samples taken during any 30-day period exceed 400/100 ml.	FW2 , SE1, and SC 1500 feet to 3 miles from the shoreline
	(3)	Fecal coliform levels shall not exceed a geometric average of 770/100 ml.	SE2
	(4)	Fecal coliform levels shall not exceed a geometric average of 1500/100ml.	SE3

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7:9-4.14 (c) Surface Water Quality Criteria for FW2, SE and SC Waters

(Expressed as maximum concentrations unless otherwise noted)

Substance		Criteria	Classifications
3. Dissolved oxygen (mg/l)	i.	Not less than 7.0 at any time.	FW2-TP
	ii.	24 hour average not less than 6.0. Not less than 5.0 at any time (see paragraph viii below).	FW2-TM
	iii.	24 hour average not less than 5.0, but not less than 4.0 at any time (see paragraph viii below).	FW2-NT (except as iv below), SE1
	iv.	Not less than 4.0 at any time.	Tidal portions of FW2-NT tributaries the Delaware River between Rancocas Creek and Big Timb Creek inclusive.
	v.	Not less than 5.0 at any time.	SC
	vi.	Not less than 4.0 at any time.	SE2
	vii.	Not less than 3.0 at any time.	SE3
	viii.	Supersatuarted dissolved oxygen values shall be expressed as their corresponding 100 percent saturation values for purposes of calculating 24 hour averages.	FW2-TM, FW2-NT, S[illegible]

7:9-4.14 (c) Surface Water Quality Criteria for FW2,SE and SC Waters

(Expressed as maximum concentrations unless otherwise noted)

Substance		Criteria		Classifications
		ii.	Streams: Except as necessary to satisfy the more stringent criteria in paragraph i above or where site-specific criteria are developed pursuant to N.J.A.C 7:9-4.5(g)3, phosphorus as total P shall not exceed 0.1 in any stream, unless it can be demonstrated that total P is not a limiting nutrient and will not otherwise render the waters unsuitable for the designated uses.	FW2
7.	Radioactivity	i.	Prevailing regulations adopted by the U.S. Environmental Protection Agency pursuant to Sections 1412, 1445, and 1450 of the Public Health Services Act, as amended by the Safe Drinking Water Act (PL 93-523)	All Classificatio
8.	Solids, Suspended (mg/l) (Non-filterable residue)	i.	25.0	FW2-TP, FW2-TM
		ii.	40.0	FW2-NT
		iii.	None which would render the waters unsuitable for the designated uses.	All SE, SC

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7:9-4.14 (c) Surface Water Quality Criteria for FW2,SE and SC Waters

(Expressed as maximum concentrations unless otherwise noted)

Substance	Criteria	Classifications
	(1) Streams	
	(i) No thermal alterations which would cause changes in ambient temperatures except where properly treated wastewater effluents are discharged. Where such discharges occur, temperatures shall not deviate more than 0.6°C (1°F) from ambient temperature.	FW2-TP
	(ii) No thermal alterations which would cause temperatures to exceed ambient by more than 1.1°C (2°F) at any time or which would cause temperatures in excess of 20°C (68°F).	FW2-TM
	(iii) No thermal deviations which would cause temperatures to deviate more than 2.8°C (5°F) at any time from ambient temperatures. No heat may be added which would cause temperatures to exceed 27.8°C (82°F) for small mouth bass or yellow perch waters, or 30°C (86°F) for other nontrout waters.	FW2-NT

7:9-4.14 (c) Surface Water Quality Criteria for FW2, SE and SC Waters

(Expressed as maximum concentrations unless otherwise noted)

Substance	Criteria	Classifications
	(3) Coastal Waters - No direct heat additions within 1500 feet of the shoreline. No thermal alterations which would cause temperatures to deviate from ambient temperatures by more than 2.2°C (4°F) from September through May, nor more than 0.8°C (1.5°F) from June through August, nor which would cause temperatures to exceed 26.7°C (80°F).	SC
	ii. Heat Dissipation Areas	
	(1) Streams	FW2-TM, FW2-NT, All SE
	(i) Not more than one-quarter (1/4) of the cross section and/or volume of the water body at any time.	
	(ii) Not more than two-thirds (2/3) of the surface from shore to shore at any time.	

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7:9-4.14 (c) Surface Water Quality Criteria for FW2,SE and SC Waters

(Expressed as maximum concentrations unless otherwise noted)

Substance	Criteria	Classifications
	iii. Toxic substances shall not be present in concentrations that cause acute or chronic toxicity to aquatic biota, or bioaccumulate within an organism to concentrations that exert a toxic effect on that organism or render it unfit for consumption.	All Classifications
	iv. The concentrations of nonpersistent toxic substances in the State's waters shall not exceed one-twentieth (0.05) of the acute definitive LC50 or EC50 value, as determined by appropriate bioassays conducted in accordance with N.J.A.C. 7:18.	All Classifications
	v. The concentration of persistent toxic substances in the State's waters shall not exceed one-hundreth (0.01) of the acute definitive LC50 or EC50 value, as determined by appropriate bioassays conducted in accordance with N.J.A.C. 7:18.	All Classifications

7:9-4.14 (c) Surface Water Quality Criteria for FW2, SE and SC Waters

(Expressed as maximum concentrations unless otherwise noted)

Substance		Criteria	Classifications
ii. Ammonia, un-ionized (24 hr. average)	(1)	20 (a)	FW2-TP, FW2-TM
	(2)	50 (a)	FW2-NT
	(3)	0.1 of acute definitive LC50 or EC50 (a)	All SE, SC
iii. Arsenic, Total	(1)	50 (h)	FW2
iv. Barium, Total	(1)	1000 (h)	FW2
v. Benzidine	(1)	0.1 (h*)	All Classifications
vi. Cadmium, Total	(1)	10 (h)	FW2
vii. Chlordane	(1)	0.0043(a)	FW2
	(2)	0.0040(a)	All SE, SC
viii. Chlorine Produced Oxidants (CPO)	(1)	24 hour average less than 11.0. Less than 19 at any time. (a)	FW2
	(2)	24 hour average less than 7.5. Less than 13 at any time. (a)	All SE, SC
ix. Chromium, Total	(1)	50(h)	FW2
x. DDT and Metabolites	(1)	0.0010(a)	All Classifications
xi. Endosulfan	(1)	0.056(a)	FW2
	(2)	0.0087(a)	All SE, SC
xii. Endrin	(1)	0.0023(a)	All Classifications

7:9-4.14 (d) Surface Water Quality Criteria for the Mainstem Delaware River and Delaware Bay - Zones 1C Through 6

SUBSTANCE		CRITERIA	ZONES
1. General Criteria	i.	The waters shall not contain substances attributable to municipal, industrial, or other discharges in concentrations or amounts sufficient to preclude the specified water uses to be protected. Within this requirement: (1) The waters shall be substantially free from unsightly or malodorous nuisances due to floating solids, sludge deposits, debris, oil, scum; and substances in concentrations or combinations which are toxic or harmful to human, animal, plant, or aquatic life, or that produce color, taste, or odor in the water, or that taint fish or shellfish flesh.	All Zones
	ii.	In no case shall concentrations of substances exceed those values given for rejection of water supplies in the United States Public Health Service Drinking Water Standards.	All Zones
2. Alkalinity	i.	Not less than 20 mg/l.	1E
	ii.	Must be maintained between 20 and 100 mg/l.	2

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88410043

7:9-4.14 (d) Surface Water Quality Criteria for the Mainstem Delaware River and Delaware Bay - Zones 1C Through 6

SUBSTANCE		CRITERIA	ZONES
		(4) Maximum geometric average of 770 per 100 ml from R.M. 78.8 to 59.5, and of 200 per 100 ml from R.M. 59.5 to 48.2. Samples shall be taken at such frequency and location as to permit valid interpretation.	5
4. Chlorides	i.	Maximum 15-day average of 50 mg/l.	2
	ii.	Maximum 30-day average concentration of 180 mg/l at R.M. 98.	3
5. Detergents, Synthetic (Methylene blue active substances (MBAS))	i.	Not to exceed 0.5 mg/l.	1C,1D,1E
	ii.	Maximum 30-day average of 0.5 mg/l.	2
	iii.	Maximum 30-day average of 1.0 mg/l.	3,4,5,6
6. Dissolved Oxygen	i.	Not less than 4.0 mg/l at any time; minimum 24-hour average concentration of 5.0 mg/l.	1C,1D,1E
	ii.	Minimum 24 hour average concentration shall not be less than 5.0 mg/l. During periods from April 1 to June 15 and September 16 to December 31 the seasonal average shall not be less than 6.5 mg/l.	2

88410044

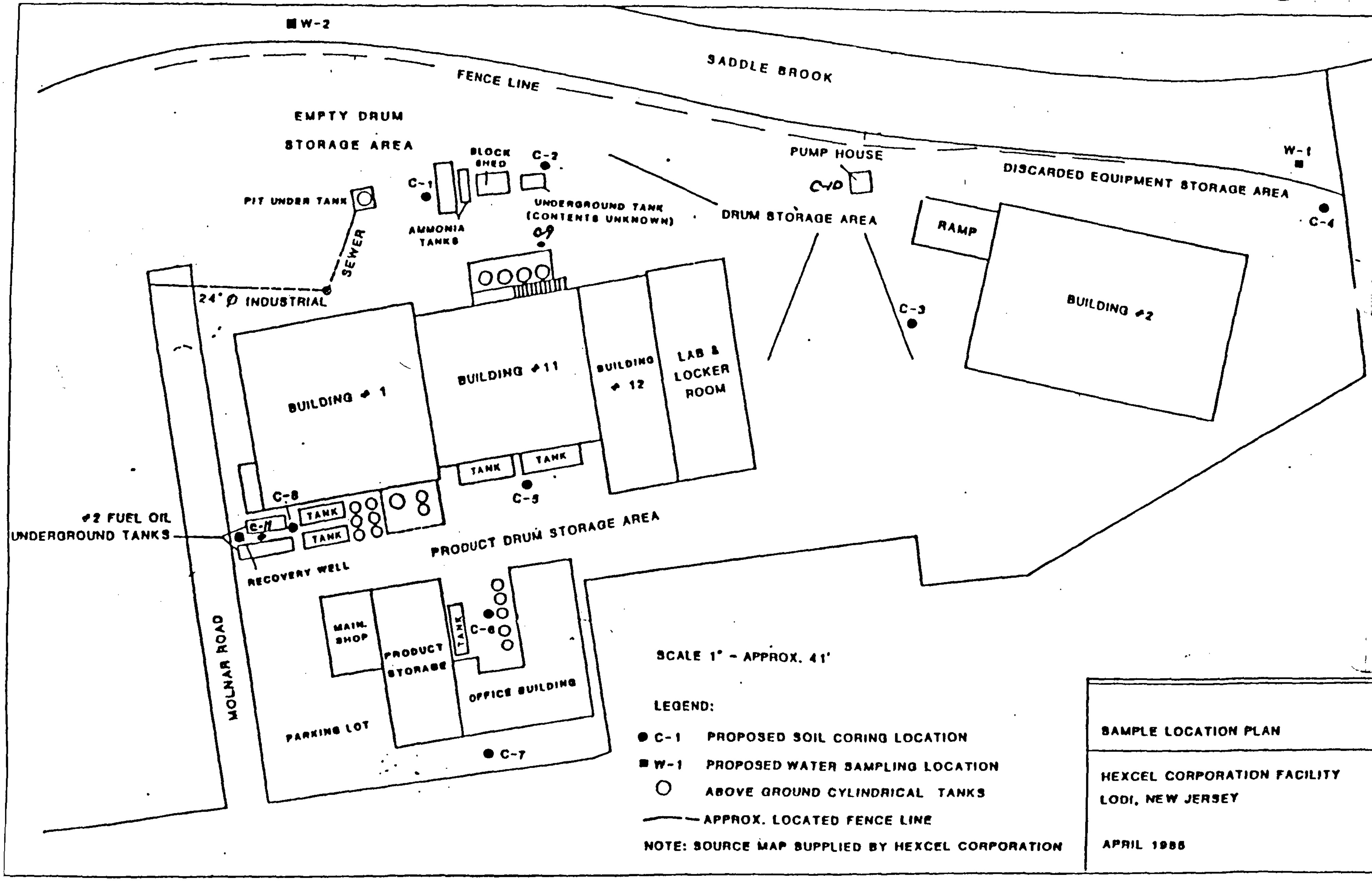
7:9-4.14 (d) Surface Water Quality Criteria for the Mainstem Delaware River and Delaware Bay - Zones 1C Through 6

SUBSTANCE		CRITERIA	ZONES
	ii.	Maximum of 0.02 mg/l, unless exceeded due to natural conditions.	4
	iii.	Maximum of 0.01 mg/l, unless exceeded due to natural conditions.	5,6
10. Radioactivity	i.	Alpha emitters - maximum 3 pc/l (picocuries per liter).	All Zones
	ii.	Beta emitters - maximum 1,000 pc/l.	All Zones
11. Sodium	i.	Maximum 30-day average concentration of 100 mg/l at R.M. 98.	3
12. Solids, Total Dissolved (Filterable Residue)	i.	Not to exceed 133 percent of background or 500 mg/l, whichever is less. (Background is 90 mg/l for Zones 1C and 1D and 200 mg/l for Zones 1E and 2).	1C,1D,1E,2,3
	ii.	Not to exceed 133 percent of background.	4,5,6
13. Temperature and Heat Dissipation Areas.	i.	Temperature, except in designated heat dissipation areas:	
		(1) Shall not be raised more than 5°F (2.8°C) above ambient temperature until stream temperatures reach 87°F (30.6°C); above 87°F (30.6°C) natural temperature will prevail.	1C,1D,1E

7:9-4.14 (d) Surface Water Quality Criteria for the Mainstem Delaware River and Delaware Bay - Zones 1C Through 6

SUBSTANCE	CRITERIA	ZONES
	(1) Maximum Length:	
	(i) 1000 feet or twenty times the average width of the stream, whichever is less, measured from the point where the waste discharge enters the stream.	1C
	(ii) 3500 feet or twenty times the average width of the stream, whichever is less, measured from the point where the waste discharge enters the stream.	1D,1E
	(iii) 3500 feet measured from the point where the waste discharge enters the stream.	2,3,4,5,6
	(2) Maximum Width:	
	(i) One-half the surface width of the stream or the width encompassing one-half of the entire cross-sectional area of the stream, whichever is less. Within any one heat dissipation area only one shore shall be used in determining the limits of the area.	1C,1D,1E

APPENDIX B


W-2
SADDLE BROOK
FENCE LINE
EMPTY DRUM
STORAGE AREA
PUMP HOUSE
C-10
W-1
DISCARDED EQUIPMENT STORAGE AREA
C-4
BLOCK SHED
C-2
C-1
PIT UNDER TANK
AMMONIA TANKS
UNDERGROUND TANK (CONTENTS UNKNOWN)
C-9
DRUM STORAGE AREA
RAMP
SEWER
24" Ø INDUSTRIAL
C-3
BUILDING #2
BUILDING #1
BUILDING #11
BUILDING #12
LAB & LOCKER ROOM
TANK
TANK
C-5
C-8
TANK
TANK
C-11
#2 FUEL OIL UNDERGROUND TANKS
RECOVERY WELL
PRODUCT DRUM STORAGE AREA
MAIN. SHOP
PRODUCT STORAGE
TANK
C-6
OFFICE BUILDING
MOLNAR ROAD
PARKING LOT
C-7
SCALE 1" - APPROX. 41'
LEGEND:
C-1 PROPOSED SOIL CORING LOCATION
W-1 PROPOSED WATER SAMPLING LOCATION
ABOVE GROUND CYLINDRICAL TANKS
APPROX. LOCATED FENCE LINE
NOTE: SOURCE MAP SUPPLIED BY HEXCEL CORPORATION
SAMPLE LOCATION PLAN
HEXCEL CORPORATION FACILITY
LODI, NEW JERSEY
APRIL 1985

8841000048

PRINCETON AQUA SCIENCE

165 Fieldcrest Avenue • CN 7809 • Edison, New Jersey 08818-7809 • Telephone (201) 225-2000

Company Hexcel Corporation
Address 11711 Dublin Blvd.
City Dublin State CA Zip 94568-0705
To Attn. of: Mr. William Nosil

Job #: 8433
Date: 6/28/85
Auth.:
Lot #: 7503
Invoice #: --
Sample Date: 6/1/85
N.J. Lab Certification ID# 12064

REPORT OF ANALYSIS

	PAS #40315 Stream W-1 (mg/l)
Cyanide	<0.02
Phenols	`0.005
Antimony	<0.02
Arsenic	<0.01
Beryllium	<0.001
Cadmium	<0.02
Chromium	<0.05
Copper	<0.007
Lead	<0.02
Mercury	<0.002
Nickel	<0.05
Selenium	<0.01
Silver	<0.01
Thallium	<0.08
Zinc	0.03

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Sample Date: 6/1/85
N.J. Lab Certification ID# 12064

Pesticide and PCB Compounds (by GC)	PAS #40315 Stream W-1 (ppb)
ALDRIN	ND
BHC-alpha	ND
BHC-beta	ND
BHC-gamma	ND
BHC-delta	ND
CHLORDANE	ND
4,4'-DDD	ND
4,4'-DDE	ND
4,4'-DDT	ND
DIELDRIN	ND
ENDOSULFAN I	ND
ENDOSULFAN II	ND
ENDOSULFAN SULFATE	ND
ENDRIN	ND
ENDRIN ALDEHYDE	ND
HEPTACHLOR	ND
HEPTACHLOR EPOXIDE	ND
TOXAPHENE	ND
PCB-1016	ND
PCB-1221	ND
PCB-1232	ND
PCB-1242	ND
PCB-1248	ND
PCB-1254	ND
PCB-1260	ND

ND-NONDETECTABLE LESS THAN 10ppb FOR PESTICIDES AND LESS THAN 100ppb FOR PCB's AND TOXAPHENE.

PAS

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Invoice #: --
Sample Date: 6/1/85
N.J. Lab Certification ID# 12064

Purgeable Organic Compounds (by GC/MS)	PAS #40315, Stream W-1 (ppb)
BENZENE	ND
BIS (CHLOROMETHYL) ETHER	ND
BROMOFORM	ND
CARBON TETRACHLORIDE	ND
CHLOROBENZENE	ND
CHLORODIBROMOMETHANE	ND
CHLOROETHANE	ND
2-CHLOROETHYLVINYL ETHER	ND
CHLOROFORM	ND
DICHLOROBROMOMETHANE	ND
DICHLORODIFLUOROMETHANE	ND
1,1-DICHLOROETHANE	ND
1,2-DICHLOROETHANE	ND
1,1-DICHLOROETHYLENE	ND
1,2-DICHLOROPROPANE	ND
1,3-DICHLOROPROPYLENE	ND
ETHYLBENZENE	ND
METHYL BROMIDE	ND
METHYL CHLORIDE	ND
METHYLENE CHLORIDE	ND
1,1,2,2-TETRACHLOROETHANE	ND
TETRACHLOROETHYLENE	ND
TOLUENE	ND
TRANS 1,2-DICHLOROETHYLENE	ND
1,1,1-TRICHLOROETHANE	ND
1,1,2-TRICHLOROETHANE	ND
TRICHLOROETHYLENE	ND
TRICHLOROFLUOROMETHANE	ND
VINYL CHLORIDE	ND

ND-NONDETECTABLE LESS THAN 5ppb

ADDITIONAL COMPOUNDS
---------- ---------

ACROLEIN	ND (<100ppb)
ACRYLONITRILE	ND (<100ppb)

APPENDIX C

Table 1
Hexcel Air Stripping Tower
Performance Test 3

Volatile Organic Compounds	Influent Water Design Maximum	Influent Raw Water	After Pass 1 Dual AST	After Pass 2 Dual AST prior to GAC	Percent Reduction		
					1st Pass	2nd Pass	Total
Sample #	mg/ℓ	S-2620 mg/ℓ	S-2629 mg/ℓ	S-2629 mg/ℓ			
Methylene chloride	11.0	131.889	1.254	0.665	99.05%	46.94%	99.50%
Chloroform	0.2	2.595	< 0.050	< 0.025	98.07%	50.00%	99.04%
1,2-Dichloroethane	0.2	7.956	< 0.050	< 0.025	99.37%	50.00%	99.69%
Trichloroethene	1.0	3.245	0.215	0.049	93.36%	77.33%	98.50%
Toluene	2.3	3.654	< 0.050	0.028	98.63%	43.40%	99.23%
Tetrachloroethene	2.4	17.103	0.297	0.290	98.27%	2.39%	98.31%
Chlorobenzene	13.0	68.712	0.603	0.692	99.12%	-14.79%	98.99%
1,2-Dichlorobenzene	0.1	4.047	< 0.100	0.040	97.53%	60.30%	99.02%
1,4-Dichlorobenzene	0.04	15.352	0.318	0.260	97.93%	18.06%	98.30%
Total Volatiles		254.552	2.937	2.075	98.85%	29.36%	99.18%
Semivolatile Organic Compounds							
bis-(2-chloroethyl)ether		0.040	0.100	0.070	-147.20%	29.25%	-74.91%
1,4-Dichlorobenzene		0.272	< 0.010	0.007	96.33%	30.00%	97.43%
1,2-Dichlorobenzene		0.141	0.002 J	0.016	98.58%	-700.00%	88.62%
1,2,4-Trichlorobenzene		0.038	< 0.010	< 0.010	73.51%	0.00%	73.51%
Di-n-butylphthalate		0.006	0.007 J	0.013	-16.67%	-82.86%	-113.33%
bis-(2-ethylhexyl)phthalate		0.007	0.008 J	0.074	-14.29%	-827.50%	-960.00%
Total Semivolatiles		0.504	0.137	0.190	72.90%	-39.49%	62.21%

< - Less than detection limit
J - Detected below detection limit

91JR4116.T1

Table 2
Hexcel Air Stripping Tower
Performance Test 4

Volatile Organic Compounds	Influent Water Design Maximum	Influent Raw Water	After Pass 1 Dual AST	After Pass 2 Dual AST prior to GAC	Percent Reduction 1st Pass	2nd Pass	Total
Sample #	mg/ℓ	S-2635 mg/ℓ	S-2635 mg/ℓ	S-2629 mg/ℓ			
Methylene chloride	11.0	275.264	1.683	0.568	99.39%	66.22%	99.79%
Chloroform	0.2	< 3.575	< 0.050	< 0.025	98.60%	50.00%	99.30%
1,2-Dichloroethane	0.2	< 3.575	< 0.050	< 0.025	98.60%	50.00%	99.30%
Trichloroethene	1.0	11.457	0.203	< 0.025	98.23%	87.70%	99.78%
Toluene	2.3	5.168	0.064	< 0.025	98.77%	60.75%	99.52%
Tetrachloroethene	2.4	29.134	0.683	0.092	97.65%	86.49%	99.68%
Chlorobenzene	13.0	42.852	0.834	0.049	98.05%	94.10%	99.89%
1,2-Dichlorobenzene	0.1	4.267	0.086^J	< 0.050	97.98%	41.86%	98.83%
1,4-Dichlorobenzene	0.04	21.439	0.642	0.037	97.01%	94.31%	99.83%
Total Volatiles		396.731	4.295	0.896	98.92%	79.13%	99.77%
Semivolatile Organic Compounds							
bis-(2-chloroethyl)ether		0.008^J	< 0.010	< 0.010	-25.00%	0.00%	-25.00%
1,3-Dichlorobenzene		< 0.010	0.015	< 0.010	-45.00%	31.03%	0.00%
1,4-Dichlorobenzene		0.248	0.217	< 0.010	12.64%	95.39%	95.97%
1,2-Dichlorobenzene		0.775	0.055	< 0.010	92.87%	81.92%	98.71%
Isophorone		< 0.010	< 0.010	0.068	0.00%	-576.00%	-576.00%
2,4-Dimethylphenol		0.020	< 0.010	< 0.010	50.00%	0.00%	50.00%
1,2,4-Trichlorobenzene		0.038	< 0.010	< 0.010	73.51%	0.00%	73.51%
4-Chloro-3-methylphenol		< 0.010	< 0.010	0.043	0.00%	-328.00%	-328.00%
Dimethylphthalate		0.003^J	0.003^J	0.013	0.00%	-346.67%	-346.67%
2,4-Dinitrophenol		0.012	0.008^J	< 0.050	34.96%	-525.00%	-306.50%
4-Dinitrophenol		< 0.050	0.008^J	0.030	84.00%	-277.50%	39.60%
4,6-Dinitro-3-methylphenol		0.006^J	0.006^J	0.020	0.00%	-228.33%	-228.33%
Di-n-butylphthalate		0.005^J	0.005^J	0.002^J	0.00%	60.00%	60.00%
bis-(2-ethylhexyl)phthalate		0.007^J	0.019	0.164	-168.57%	-770.74%	-2238.57%
Total Semivolatiles		1.203	0.386	0.449	67.94%	-16.55%	62.64%

< - Less than detection limit
J - Detected below detection limit

91JR4116.T1

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Company: Hexcel Corporation
Address: 11711 Dublin Blvd.
City: Dublin State: CA Zip: 94568-0705
To Attn. of: Mr. William Nosil

Job #: 8433
Date: 6/23/85
Auth.:
Lot #: 7503
Invoice #: --
Sample Date: 6/1/85
N.J. Lab Certification ID# 12064

Acid Extractable Compounds (by GC/MS)	PAS #40315 Stream W-1 (ppb)
4-CHLORO-3-METHYLPHENOL	ND
2-CHLOROPHENOL	ND
2.4-DICHLOROPHENOL	ND
2.4-DIMETHYLPHENOL	ND
2.4-DINITROPHENOL	ND
2-METHYL-4.6-DINITROPHENOL	ND
2-NITROPHENOL	ND
4-NITROPHENOL	ND
PENTACHLOROPHENOL	ND
PHENOL	ND
2.4.6-TRICHLOROPHENOL	ND

ND-NONDETECTABLE LESS THAN 20ppb

pas

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Job #: 8433
Date: 6/28/85
Auth.:
Lot #: 7503
Invoice #: --
Sample Date: 6/1/85
N.J. Lab Certification ID# 12064

Base Neutral Compounds (by GC/MS)	PAS #40315 Stream W-1 (ppb)
ACENAPHTHENE	ND
ACENAPHTHYLENE	ND
ANTHRACENE	ND
BENZO(a)ANTHRACENE	ND
BENZO(b)FLUORANTHENE	ND
BENZO(k)FLUORANTHENE	ND
BENZO(a)PYRENE	ND
BENZO(g,h,i)PERYLENE	ND
BENZIDINE	ND
BIS(2-CHLOROETHYL)ETHER	ND
BIS(2-CHLOROETHOXY)METHANE	ND
BIS(2-ETHYLHEXYL)PHTHALATE	53
BIS(2-CHLOROISOPROPYL)ETHER	ND
4-BROMOPHENYL PHENYL ETHER	ND
BUTYL BENZYL PHTHALATE	ND
2-CHLORONAPHTHALENE	ND
4-CHLOROPHENYL PHENYL ETHER	ND
CHRYSENE	ND
DIBENZO(a,h)ANTHRACENE	ND
DI-n-BUTYLPHTHALATE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
3,3'-DICHLOROBENZIDENE	ND
DIETHYLPHTHALATE	ND
DIMETHYLPHTHALATE	ND
2,4-DINITROTOLUENE	ND

PAS

PRINCETON AQUA SCIENCE

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Company Hexcel Corporation
Address 11711 Dublin Blvd.
City Dublin State CA Zip 94568-0705
To Attn. of: Mr. William Nosil

Job #: 8433
Date: 6/28/85
Auth.:
Lot #: 7503
Invoice #: --
Sample Date: 6/1/85
N.J. Lab Certification ID# 12064

Base Neutral Compounds (by GC/MS)	PAS #40315 Stream W-1 (ppb)
2,6-DINITROTOLUENE	ND
DI-n-OCTYLPHTHALATE	ND
1,2-DIPHENYLHYDRAZINE	ND
FLUORANTHENE	ND
FLUORENE	ND
HEXACHLOROBENZENE	ND
HEXACHLOROBUTADIENE	ND
HEXACHLOROETHANE	ND
HEXACHLOROCYCLOPENTADIENE	ND
IDENO(1,2,3-cd)PYRENE	ND
ISOPHORONE	ND
NAPHTHALENE	ND
NITROBENZENE	ND
N-NITROSODIMETHYLAMINE	ND
N-NITROSODI-n-PROPYLAMINE	ND
N-NITROSODIPHENYLAMINE	ND
PHENANTHRENE	ND
PYRENE	ND
1,2,4-TRICHLOROBENZENE	ND

ND-NONDETECTABLE LESS THAN 20ppb

PAS

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Company Hexcel Corporation
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To Attn. of: Mr. William Nosil

Job #: 8433
Date: 6/28/85
Auth.:
Lot #: 7503
Invoice #: --
Sample Date: 6/1/85
N.J. Lab Certification ID# 12064

REPORT OF ANALYSIS

	PAS #40314 Stream W-2 (mg/l)
Cyanide	<0.02
Phenols	0.003
Antimony	<0.02
Arsenic	<0.01
Beryllium	<0.001
Cadmium	<0.02
Chromium	<0.05
Copper	<0.007
Lead	<0.02
Mercury	<0.002
Nickel	<0.05
Selenium	<0.01
Silver	<0.01
Thallium	<0.08
Zinc	0.02

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Job #: 8433
Date: 6/28/85
Auth.:
Lot #: 7503
Invoice #: --
Sample Date: 6/1/85
N.J. Lab Certification ID# 12064

Pesticide and PCB Compounds (by GC)	PAS #40314 Stream W-2 (ppb)
ALDRIN	ND
BHC-alpha	ND
BHC-beta	ND
BHC-gamma	ND
BHC-delta	ND
CHLORDANE	ND
4,4'-DDD	ND
4,4'-DDE	ND
4,4'-DDT	ND
DIELDRIN	ND
ENDOSULFAN I	ND
ENDOSULFAN II	ND
ENDOSULFAN SULFATE	ND
ENDRIN	ND
ENDRIN ALDEHYDE	ND
HEPTACHLOR	ND
HEPTACHLOR EPOXIDE	ND
TOXAPHENE	ND
PCB-1016	ND
PCB-1221	ND
PCB-1232	ND
PCB-1242	ND
PCB-1248	ND
PCB-1254	ND
PCB-1260	ND

ND-NONDETECTABLE LESS THAN 10ppb FOR PESTICIDES AND LESS THAN 10ppb FOR PCB's AND TOXAPHENE.

PAS

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Job #: 8433

Date: 6/28/85

Auth.:

Lot #: 7503

Invoice #: --

Sample Date: 6/1/85

N.J. Lab Certification ID# 12064

Purgeable Organic Compounds (by GC/MS)	PAS #40314, Stream W-2 (ppb)
BENZENE	ND
BIS (CHLOROMETHYL)ETHER	ND
BROMOFORM	ND
CARBON TETRACHLORIDE	ND
CHLOROBENZENE	ND
CHLORODIBROMOMETHANE	ND
CHLOROETHANE	ND
2-CHLOROETHYLVINYL ETHER	ND
CHLOROFORM	ND
DICHLOROBROMOMETHANE	ND
DICHLORODIFLUOROMETHANE	ND
1,1-DICHLOROETHANE	ND
1,2-DICHLOROETHANE	ND
1,1-DICHLOROETHYLENE	ND
1,2-DICHLOROPROPANE	ND
1,3-DICHLOROPROPYLENE	ND
ETHYLBENZENE	ND
METHYL BROMIDE	ND
METHYL CHLORIDE	ND
METHYLENE CHLORIDE	ND
1,1,2,2-TETRACHLOROETHANE	ND
TETRACHLOROETHYLENE	ND
TOLUENE	ND
TRANS 1,2-DICHLOROETHYLENE	ND
1,1,1-TRICHLOROETHANE	ND
1,1,2-TRICHLOROETHANE	ND
TRICHLOROETHYLENE	ND
TRICHLOROFLUOROMETHANE	ND
VINYL CHLORIDE	ND

ND-NONDETECTABLE LESS THAN 5ppb

ADDITIONAL COMPOUNDS
---------- ---------

ACROLEIN	ND (<100ppb)
ACRYLONITRILE	ND (<100ppb)

PRINCETON AQUA SCIENCE

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Date: 6/28/85
Auth.:
Lot #: 7503
Invoice #: --
Sample Date: 6/1/85
N.J. Lab Certification ID# 12064

Acid Extractable Compounds (by GC/MS)	PAS #40314 Stream W-2 (ppb)
4-CHLORO-3-METHYLPHENOL	ND
2-CHLOROPHENOL	ND
2,4-DICHLOROPHENOL	ND
2,4-DIMETHYLPHENOL	ND
2,4-DINITROPHENOL	ND
2-METHYL-4,6-DINITROPHENOL	ND
2-NITROPHENOL	ND
4-NITROPHENOL	ND
PENTACHLOROPHENOL	ND
PHENOL	ND
2,4,6-TRICHLOROPHENOL	ND

ND-NONDETECTABLE LESS THAN 20ppb

PAS

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Base Neutral Compounds (by GC/MS)	PAS #40314 Stream W-2 (ppb)
ACENAPHTHENE	ND
ACENAPHTHYLENE	ND
ANTHRACENE	ND
BENZO(a)ANTHRACENE	ND
BENZO(b)FLUORANTHENE	ND
BENZO(k)FLUORANTHENE	ND
BENZO(a)PYRENE	ND
BENZO(g,h,i)PERYLENE	ND
BENZIDINE	ND
BIS(2-CHLOROETHYL)ETHER	ND
BIS(2-CHLOROETHOXY)METHANE	ND
BIS(2-ETHYLHEXYL)PHTHALATE	79
BIS(2-CHLOROISOPROPYL)ETHER	ND
4-BROMOPHENYL PHENYL ETHER	ND
BUTYL BENZYL PHTHALATE	ND
2-CHLORONAPHTHALENE	ND
4-CHLOROPHENYL PHENYL ETHER	ND
CHRYSENE	ND
DIBENZO(a,h)ANTHRACENE	ND
DI-n-BUTYLPHTHALATE	ND
1,2-DICHLOROBENZENE	ND
1,3-DICHLOROBENZENE	ND
1,4-DICHLOROBENZENE	ND
3,3'-DICHLOROBENZIDENE	ND
DIETHYLPHTHALATE	ND
DIMETHYLPHTHALATE	ND
2,4-DINITROTOLUENE	ND

pas

PRINCETON AQUA SCIENCE

165 Fieldcrest Avenue • CN 7809 • Edison, New Jersey 08818-7809 • Telephone (201) 225-2000

Company	Hexcel Corporation	Job #:	8433
		Date:	6/28/85
Address	11711 Dublin Blvd.	Auth.:	
		Lot #:	7503
City	Dublin State CA Zip 94568-0705	Invoice #:	--
		Sample Date:	6/1/85
To Attn. of:	Mr. William Nosil	N.J. Lab Certification ID# 12064	

Base Neutral Compounds (by GC/MS)	PAS #40314 Stream W-2 (ppb)
2,6-DINITROTOLUENE	ND
DI-n-OCTYLPHTHALATE	34
1,2-DIPHENYLHYDRAZINE	ND
FLUORANTHENE	ND
FLUORENE	ND
HEXACHLOROBENZENE	ND
HEXACHLOROBUTADIENE	ND
HEXACHLOROETHANE	ND
HEXACHLOROCYCLOPENTADIENE	ND
IDENO(1,2,3-cd)PYRENE	ND
ISOPHORONE	ND
NAPHTHALENE	ND
NITROBENZENE	ND
N-NITROSODIMETHYLAMINE	ND
N-NITROSODI-n-PROPYLAMINE	ND
N-NITROSODIPHENYLAMINE	ND
PHENANTHRENE	ND
PYRENE	ND
1,2,4-TRICHLOROBENZENE	ND

ND-NONDETECTABLE LESS THAN 20ppb